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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/667,491	09/23/2003	Robert Sheffield	57983.000131	1242
21967 7590 12/13/2010 HUNTON & WILLIAMS LLP INTELLECTUAL PROPERTY DEPARTMENT 1900 K STREET, N.W. SUITE 1200 WASHINGTON, DC 20006-1109				
EXAMINER				
VAN, LUAN V				
ART UNIT		PAPER NUMBER		
1724				
MAIL DATE		DELIVERY MODE		
12/13/2010		PAPER		

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

# Office Action Summary

**Application No.**

10/667,491

**Applicant(s)**

SHEFFIELD ET AL.

**Examiner**

LUAN V. VAN

**Art Unit**

1724

**Period for Reply** -- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 29 November 2010.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1, 2, 4-6, 19 and 20 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1, 2, 4-6, 19, and 20 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB-06)  
Paper No(s)/Mail Date \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_

**DETAILED ACTION**

***Response to Amendment***

Applicant's amendment of November 29, 2010 does not render the application allowable. Claims 1, 2, 4-6, 19, and 20 are pending in the application.

***Status of Objections and Rejections***

The rejection of claims 1, 2, 4-6, 19 and 20 under 35 U.S.C. 103(a) as being unpatentable over by Tanaka et al. (US patent 4959507) is withdrawn in view of Applicant's amendment. The rejection of claims 1, 2, 4-6, 19 and 20 under 35 U.S.C. 103(a) as being unpatentable over Tanaka et al. (US patent 4959507) in view of Nagai et al. (US pub 2002/0155021) is maintained.

***Claim Rejections - 35 USC § 103***

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claims 1, 2, 4-6, 19 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tanaka et al. (US patent 4959507) in view of Nagai et al. (US pub 2002/0155021).

Regarding claim 1, Tanaka et al. teaches a method for forming a bonded ceramic-metal composite substrate, the method comprising the step of: providing a layer of the circuit board 1 having the conductive circuit trace 2 (figure 1) on a surface thereof; and reducing a surface roughness (column 2 lines 23-35) of at least one

surface of the conductive circuit trace on the surface of the circuit board layer. The method of Tanaka et al. would improve performance of a signal transmitted via the conductive circuit trace, since the surface roughness of the copper element 2 is reduced. Furthermore, Tanaka et al. teaches that the median surface roughness of the copper circuit sheet be not greater than 1  $\mu\text{m}$ , or equivalent to about 254 microinches, and a maximum surface roughness be not greater than 8  $\mu\text{m}$ , or equivalent to about 387 microinches (column 3 lines 9-12).

Tanaka et al. differs from the instant claim in that the reference does not explicitly teach the smaller roughness of the instant claim.

Nagai et al. teaches that "[l]arge surface roughness of a copper foil results in the skin effect such that the current of electric signal having 1 GHz or more of frequency locally flows only on the surface of a coil. As a result, the impedance increases and the transmission of high-frequency signals is seriously influenced. Fine surface roughness is, therefore, necessary for conductive material used in a high-frequency circuit. The present inventors examined the relationship between the surface roughness and the high-frequency performance and discovered that 2 micrometer or less of surface roughness [or equivalent to about 80 microinches], in terms of the terms of the ten-point average surface-roughness (Rz) attains the desired high-frequency performance. The fine roughness can be provided by means of producing a wrought copper foil or electro-deposited copper foil under appropriate conditions, or chemically or electrolytically polishing the surface of a copper foil" (paragraph 28).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have reduced the surface roughness in the copper sheet of Tanaka et al., because a smaller surface roughness would improve the high-frequency performance of the device by reducing the impedance, as taught by Nagai et al. (paragraph 28).

Tanaka et al. is also silent to whether the etching treatment or polishing is performed laterally or transversely with respect to the circuit pattern.

However, since polishing laterally or transversely with respect to the circuit pattern are the only two possible directions, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have tried polishing the circuit pattern of Tanaka et al. either laterally or transversely in order to improve the reliability of the circuit board, as suggested by Tanaka et al. (column 1 lines 43-51).

Regarding claim 2, Tanaka et al. teaches wherein the step of reducing the surface roughness includes mechanical polishing the at least one surface (column 4 lines 59-64).

Regarding claims 4-5, the grounds of rejection of the instant claims parallel that given above in claim 1.

Regarding claim 6, Tanaka et al. teaches wherein the at least one surface of the conductive circuit trace includes one of a group consisting of: a surface parallel and distal to a surface of the circuit board; a surface parallel and proximal to the surface of the circuit board; and a surface perpendicular to the surface of the circuit board (figure 1).

Regarding claim 19, Tanaka et al. teaches wherein the conductive circuit trace is formed on the surface of the circuit board layer 1 (figure 1).

Regarding claim 20, Tanaka et al. teaches wherein the conductive circuit trace 2 is bonded (i.e., affixed, column 3 lines 56-60) to the surface of the circuit board layer 1.

### ***Response to Arguments***

Applicant's arguments filed have been fully considered but they are not persuasive. In the arguments presented on page 7 of the amendment, the applicant argues that the prior art does not explicitly disclose either a lateral smoothing technique or a transverse smoothing technique. The examiner acknowledges that Tanaka et al. is silent to whether the etching treatment or polishing is performed laterally or transversely with respect to the circuit pattern. However, since polishing laterally or transversely with respect to the circuit pattern are the only two possible directions, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have tried polishing the circuit pattern of Tanaka et al. either laterally transversely in order to improve the reliability of the circuit board, as suggested by Tanaka et al. (column 1 lines 43-51). (See MPEP 2141.)

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to LUAN V. VAN whose telephone number is (571)272-8521. The examiner can normally be reached on M-F 9:30-6:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam Nguyen can be reached on 571-272-1342. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Luan V Van/  
Examiner, Art Unit 1724  
December 10, 2010